FIGURE 1. Typical 3G Receiver Functional Block Diagram, (Prior art)
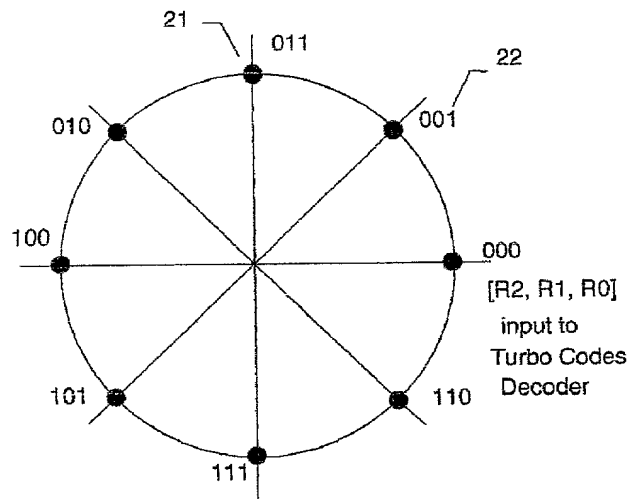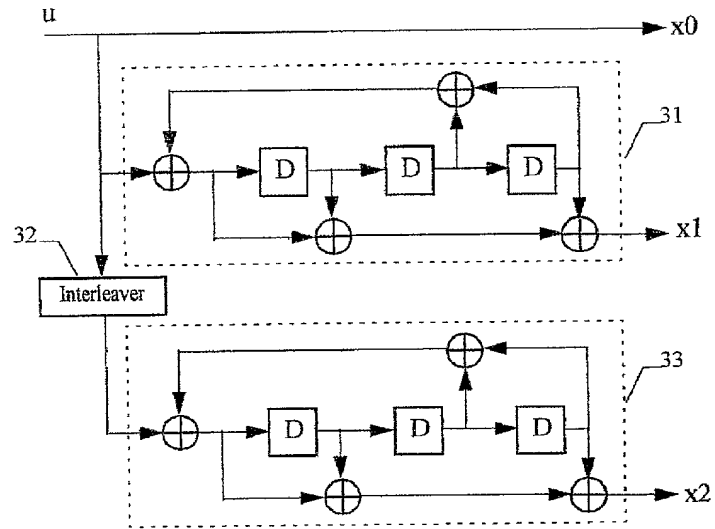
I

FIGURE 2. 8-PSK constellations, (Prior art)

$$G(D) = [1, n(D) / d(D)]$$

where, $\quad d(D) = 1 + D2 + D3, n(D) = 1 + D + D3$

FIGURE 3. The 8-states Parallel Concatenated Convolutional Code (PCCC),
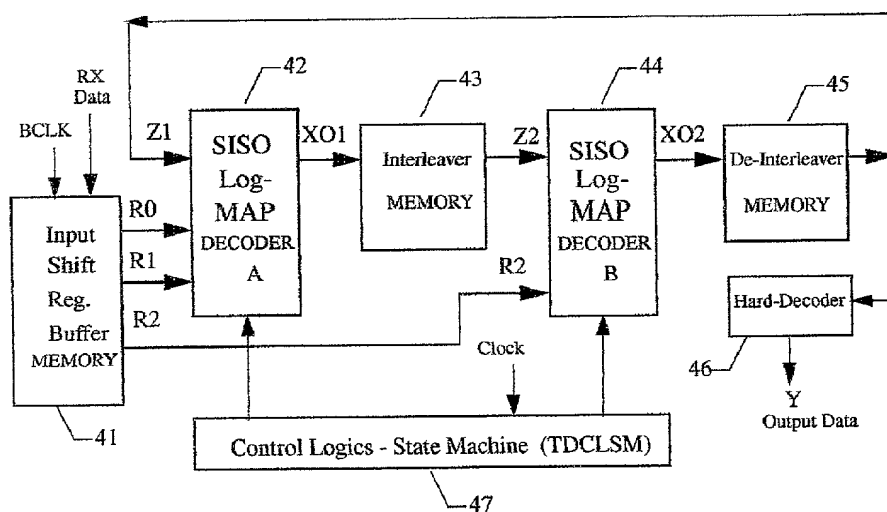
(Prior art)

FIGURE 4. Turbo Codes Decoder System Block Diagram
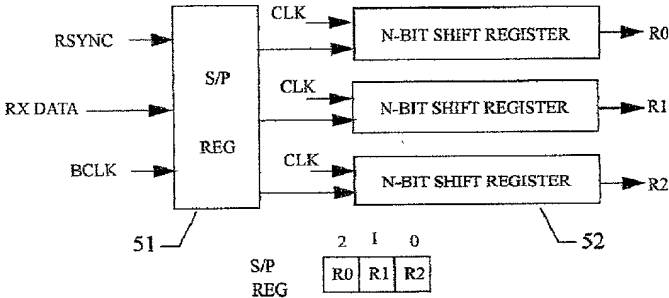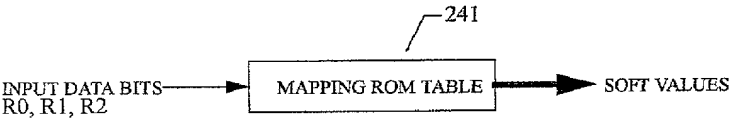
FIGURE 5. Input Buffer Shift Registers

FIGURE 5b. Soft Values Mapping ROM Table

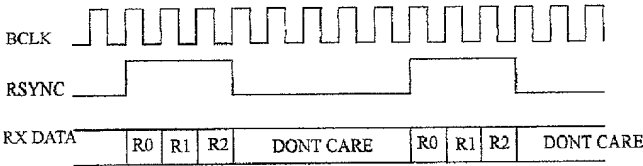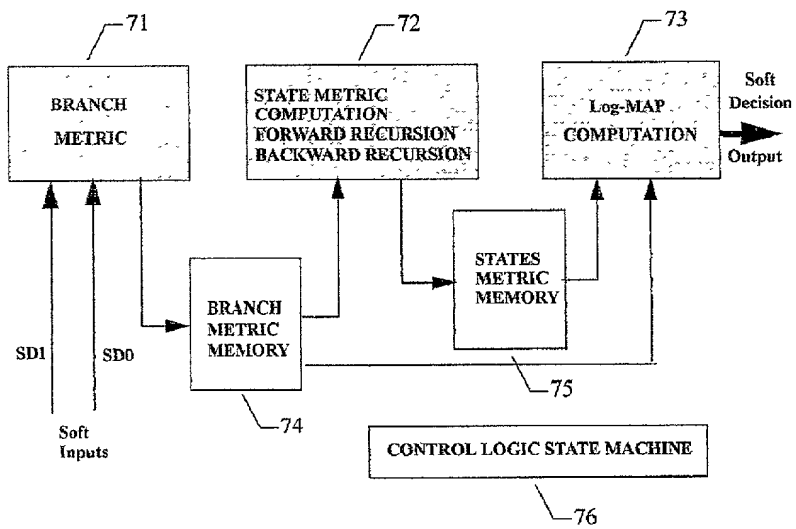FIGURE 6. Input Buffer Interface Timing

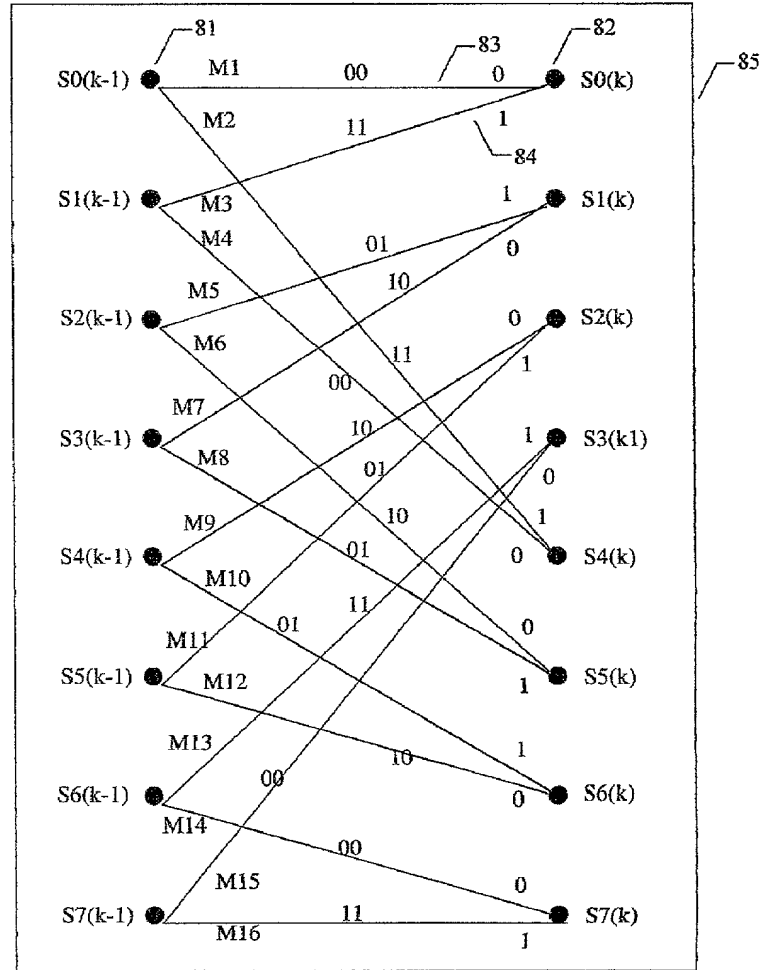FIGURE 7. The 8-states SISO Log-MAP Decoder

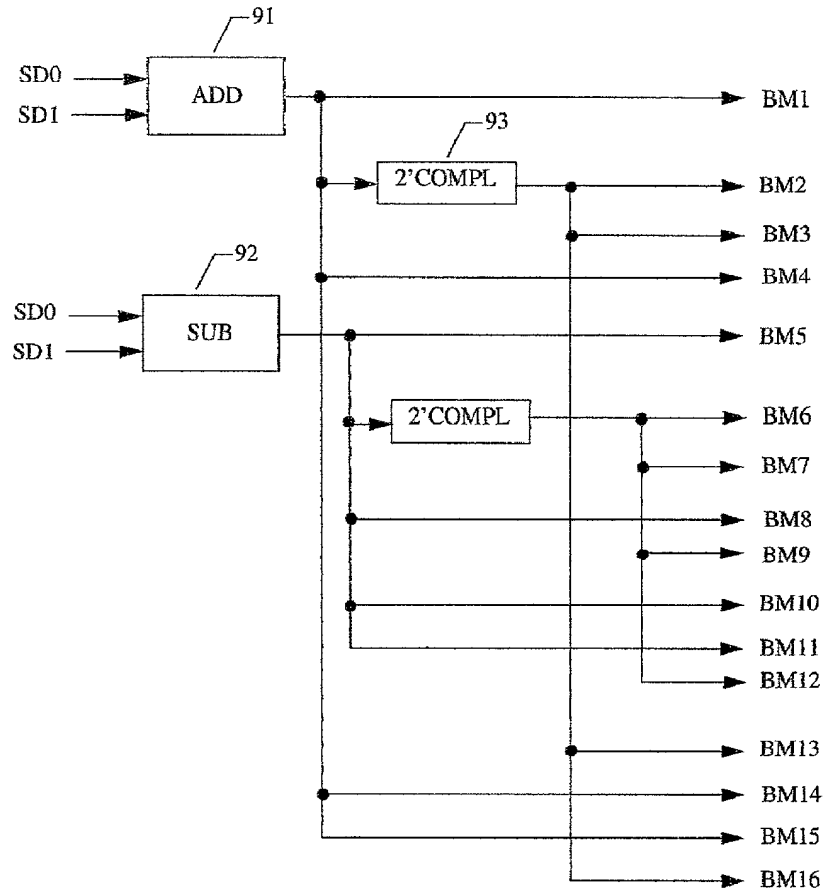FIGURE 8. The 8-STATES TRELLIS DIAGRAM of a SISO Log-MAP Decoder
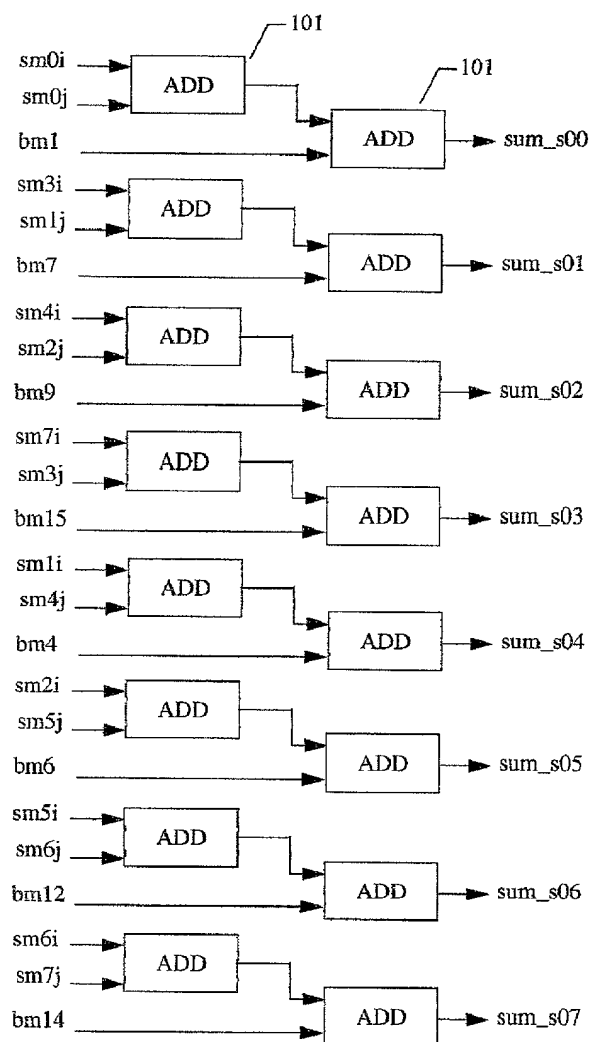
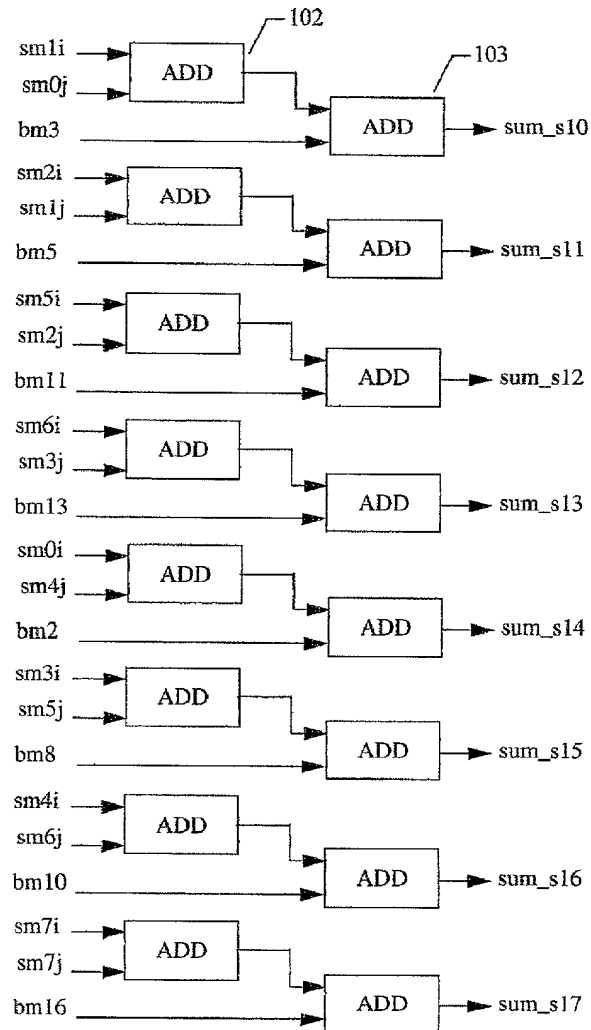FIGURE 9. BRANCH METRIC COMPUTING MODULE

FIGURE 10a. LOG-MAP COMPUTING MODULE

sm1i ——→ ┌─────────┐ ┌── 102
sm0j ——→ │   ADD   │─┐   ┌── 103
         └─────────┘ └→ ┌─────────┐
bm3 ————————————————————→│   ADD   │——→ sum_s10
                         └─────────┘

sm2i ——→ ┌─────────┐
sm1j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm5 ————————————————————→│   ADD   │——→ sum_s11
                         └─────────┘

sm5i ——→ ┌─────────┐
sm2j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm11 ———————————————————→│   ADD   │——→ sum_s12
                         └─────────┘

sm6i ——→ ┌─────────┐
sm3j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm13 ———————————————————→│   ADD   │——→ sum_s13
                         └─────────┘

sm0i ——→ ┌─────────┐
sm4j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm2 ————————————————————→│   ADD   │——→ sum_s14
                         └─────────┘

sm3i ——→ ┌─────────┐
sm5j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm8 ————————————————————→│   ADD   │——→ sum_s15
                         └─────────┘

sm4i ——→ ┌─────────┐
sm6j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm10 ———————————————————→│   ADD   │——→ sum_s16
                         └─────────┘

sm7i ——→ ┌─────────┐
sm7j ——→ │   ADD   │─┐
         └─────────┘ └→ ┌─────────┐
bm16 ———————————————————→│   ADD   │——→ sum_s17
                         └─────────┘

FIGURE 10b. LOG-MAP COMPUTING MODULE
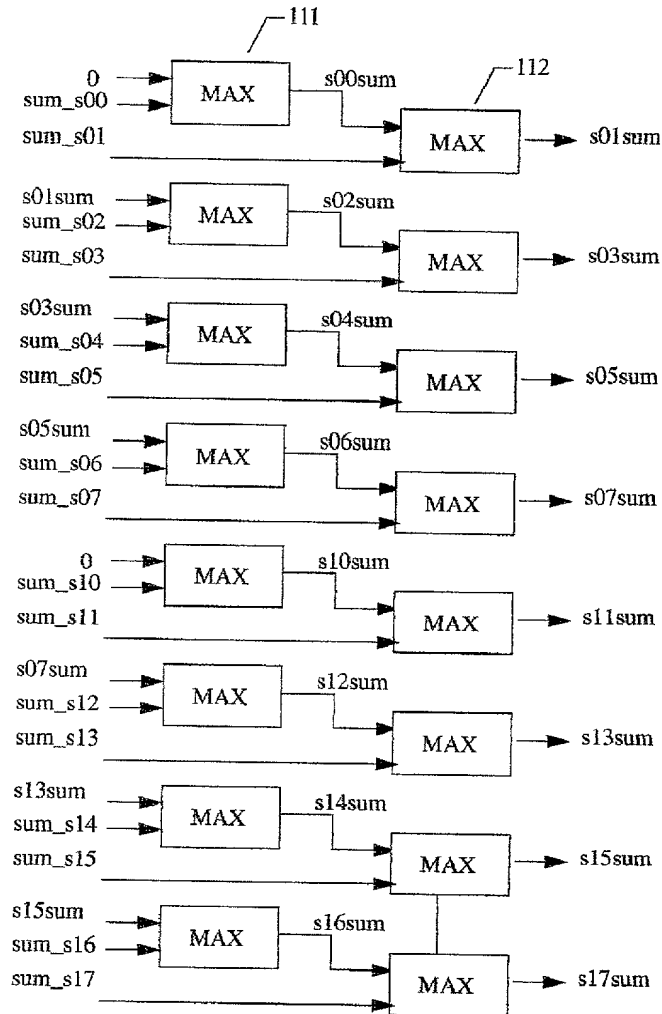
FIGURE 11. Computing Log-MAP for each state

┌─── 121

s07sum ──────▶┌─────────────┐
              │   SOFT   │
              │ DECISION   │──────▶ Soft-decode
s17sum ──────▶│ ALGORITHM │
              └─────────────┘
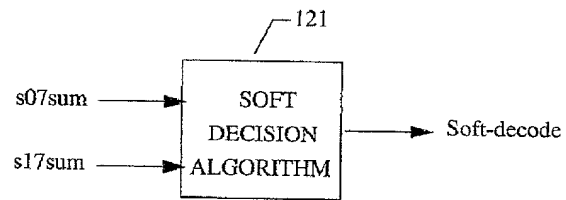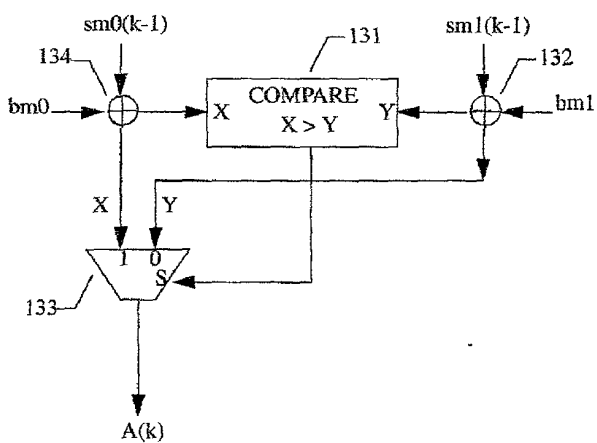
FIGURE 12. Soft Decode output
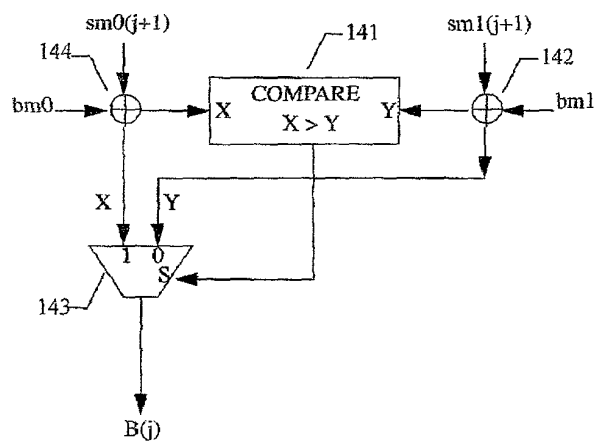
FIGURE 13. Computation of Forward Recursion of state-metric (ACS)

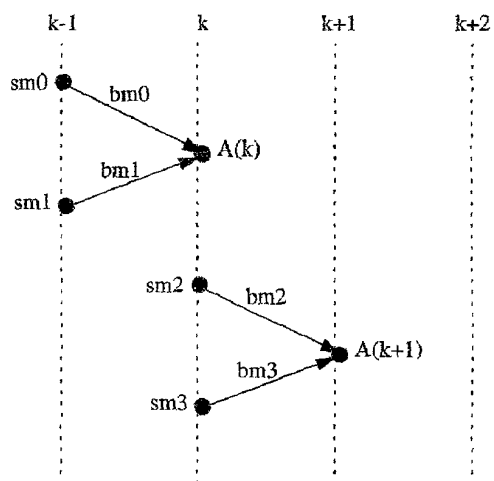FIGURE 14. Computation of Backward Recursion of state-metric (ACS)

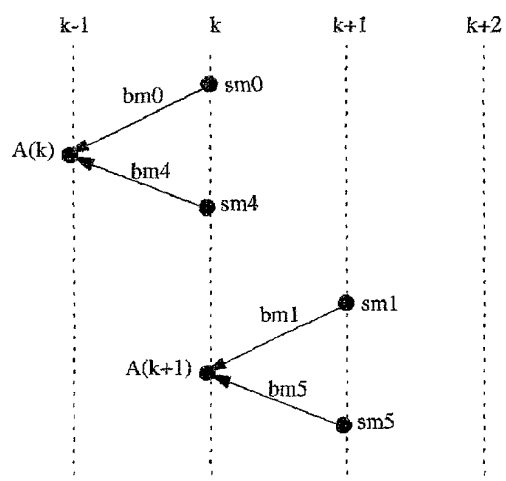FIGURE 15. Forward computing of Trellis state transitions

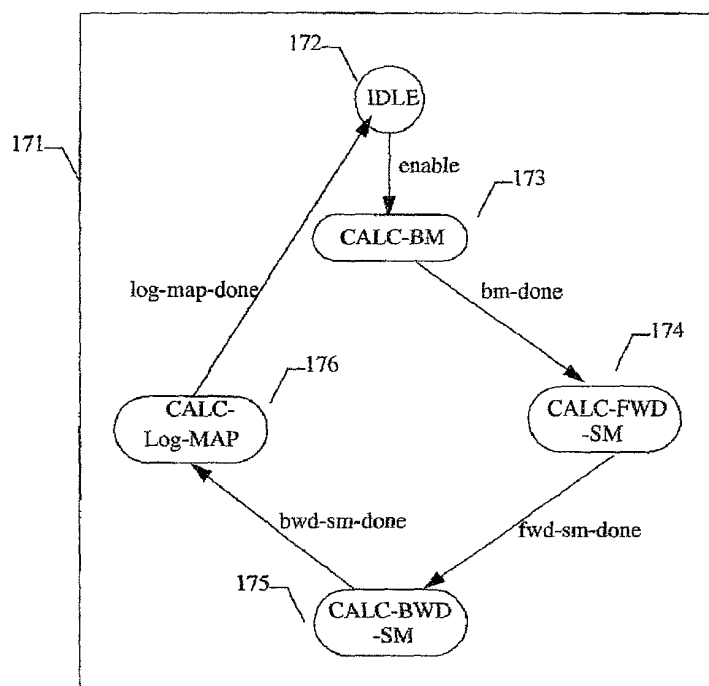FIGURE 16. Backward computing of Trellis state transitions

172

IDLE

enable

173

CALC-BM

log-map-done

bm-done

176

174

CALC-
Log-MAP

CALC-FWD
-SM

bwd-sm-done

fwd-sm-done

175

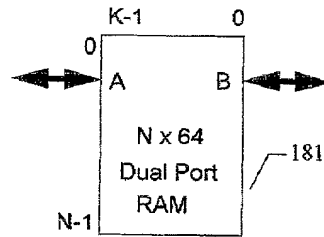CALC-BWD
-SM

171

FIGURE 17. State machine operations of Log-MAP Decoder

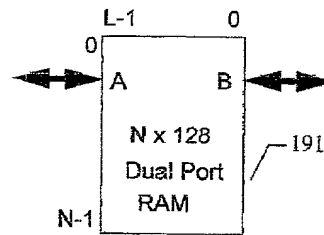FIGURE 18. BM dual-port Memory Module
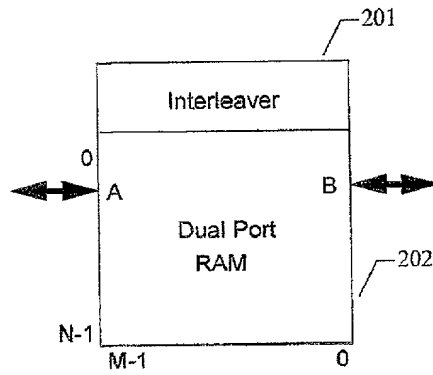

FIGURE 19. SM dual-port Memory Module

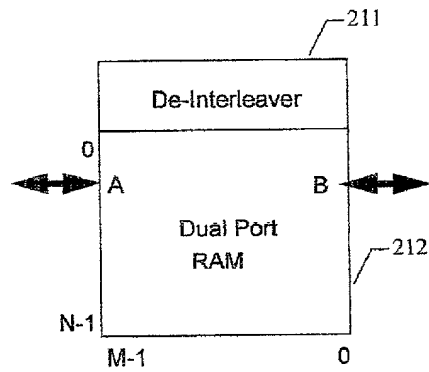FIGURE 20. Interleaver RAM Memory Module

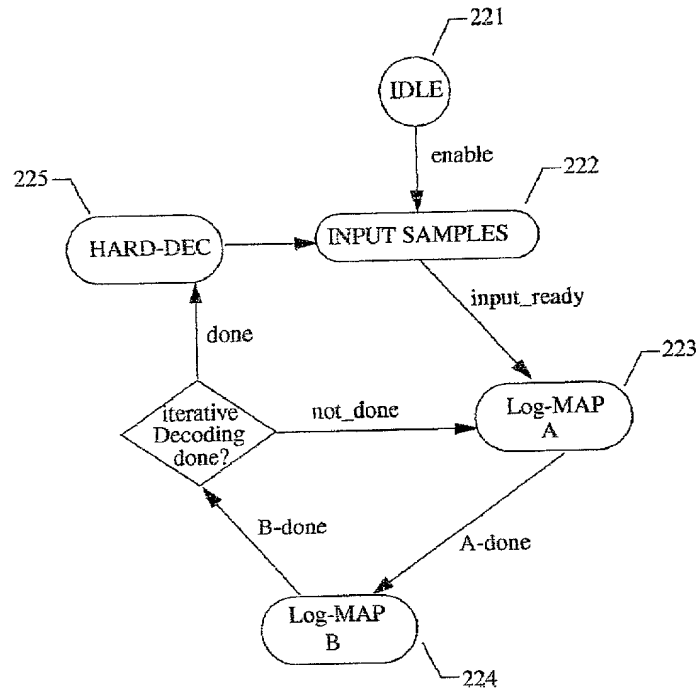FIGURE 21. De-Interleaver RAM Memory Module
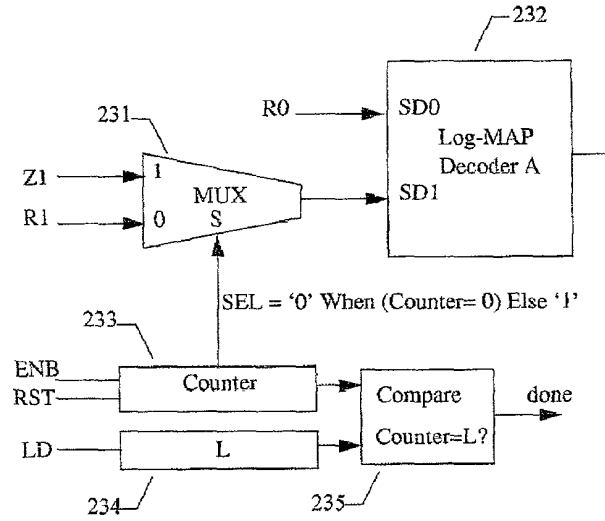
FIGURE 22. State machine operations of Turbo Decoder

FIGURE 23. Iterative decoding feedback control Mux